MAKING BUTTER ON THE FARM

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BUTTERMAKING begins with the production of the milk. Good butter can be made only from good, clean-flavored cream. To obtain practically all the cream from the milk and have it in the best condition requires the use of a cream separator.

The thorough cleaning and sterilizing of all dairy utensils is essential to the production of butter of good flavor.

Cream for buttermaking should contain about 30 per cent butterfat. A gallon of such cream will yield about 3 pounds of butter.

Cream should be kept as cold as possible until time for ripening, when it should be warmed to from 65° to 75° F. and held at that temperature until a mild-acid flavor is developed.

A thermometer should always be used in order to know that proper temperatures have been obtained.

Cream that is overripe (too sour) makes poor butter.

The churning temperature should be such that (1) the churning will require from 30 to 40 minutes, and (2) the butter granules will be firm without being hard—usually from 52° to 60° F. in summer and from 58° to 66° F. in winter.

All churning utensils should be cleaned, scalded, and cooled before they are used.

The churn should be stopped when the butter granules are the size of grains of wheat.

The butter, in the granular condition, should be washed twice with pure water at about the same temperature as the buttermilk.

Buttermilk must be washed out, not worked out.

Salt should be added at the rate of about three-quarters of an ounce to the pound of butter.

Butter should be carefully worked until the salt is evenly distributed and a solid, smooth body is formed. The best butter has a waxy body, a bright appearance, and, when a slab is broken, a grain like broken steel.

Overworked butter has a sticky, salvy body, a dull, greasy appearance, and a gummy grain. Its keeping properties are not so good as in properly worked butter.

Mottled butter is caused by the uneven distribution of salt.

Butter for market should be in prints, wrapped in parchment paper, and inclosed in paraffined cartons.

MAKING BUTTER ON THE FARM.

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EXTENT OF FARM BUTTERMAKING.

SINCE the introduction of the creamery system of butter manufacture into the United States the practice of making butter on the farm has gradually decreased and a marked change has taken place in the marketing of the product. The farm-made butter of to-day, instead of being shipped to the large markets, is consumed very largely at home and in the near-by towns or is shipped to renovating factories. In spite of the fact that on the large markets the creamery product has almost entirely supplanted dairy butter, more than half the butter in this country is made on the farms.

QUALITY AND PREPARATION OF THE CREAM.

To produce good butter it is necessary to begin with a good, clean-flavored milk.[1] In some sections of the country it is customary to ripen and churn the whole milk instead of the cream. That practice, however, is inadvisable, because it requires a high churning temperature, which injures the quality of the butter and causes a considerable loss of butterfat in the buttermilk. It is also liable to result in too much water in the butter. For those reasons only the churning of cream will be considered. It is just as essential to obtain cream under such conditions that it will be of equally good quality as the milk.

METHODS OF SEPARATING CREAM.

Cream may be separated from the milk by gravity or by a centrifugal separator. Gravity separation may be accomplished by the shallow-pan, the deep-setting, or the water-dilution method. The first two have been extensively used and are still in use where very few cows are milked. In the first method the milk is placed in

[1] Farmers' Bulletin 602, "Production of Clean Milk," will be sent free upon request.

shallow pans and set in a cool place for about 36 hours, usually in a cellar or a spring house, and sometimes in cold water, to permit the cream to rise. During that time the surface, as a rule, is exposed to the air and frequently the cream absorbs or develops objectionable flavors. The skim milk resulting from the removal of the cream by this method usually contains 0.5 to 1.5 per cent of butterfat; that is, one-eighth to one-third of all the butterfat in the whole milk. It is frequently sour also; its value for calf feeding is injured, and its use in the household limited.

By the deep-setting method the milk as soon as drawn from the cow is placed in a "shotgun" can,[1] which is placed in cold water, preferably ice water, for 12 hours. Because of the quick cooling to a low temperature the cream rises more quickly and completely than in the shallow-pan method and is skimmed before its fresh, sweet flavor has been lost. The resulting skim milk may contain as low as 0.2 per cent of butterfat, though often nearer 0.5 per cent, and is sweet. If the milk is not placed in ice water immediately after it has been drawn the loss of butterfat is still greater.

The dilution of milk with water has been used to some extent, in the belief that it aids creaming, but investigations have shown that the loss of butterfat is as great as, or greater than, in the shallow-pan method. There is the further objection that a watery flavor is imparted to the cream, and the usefulness of the skim milk is limited, mixtures of water and skim milk being undesirable either for household use or for calf feeding. The water-dilution method therefore is not advisable under any conditions.

A centrifugal separator gives by far the best results, because the separation is accomplished in a few minutes, while the milk is still warm. The skim milk usually contains only a trace of butterfat and is available for use at once, while perfectly fresh. Because of the ability of the mechanical separator to skim clean, it is a profitable investment unless the quantity of milk is very small.

THE USE OF A CREAM SEPARATOR.

A cream separator should be placed in the dairy house or dairy room where there are no odors to contaminate the milk and cream during separation. It must be set level and firmly fastened on a solid foundation so as to be rigid when in operation. If that is not done the running of the machine will cause the frame to vibrate, and as a result the bowl will wabble, the bearings wear quickly, and the separation of cream from the milk will not be complete; that is, butterfat will be lost in the skim milk. When setting up the separator a spirit level should be used to insure that the upper surface of

[1] This type of can is shown in fig. 1 and is described under the heading "Equipment for farm butter making," page 20.

the bowl casing is level. If the machine is set upon wood, lag screws may be used to fasten it in place; if upon cement, a bolt should be set in the floor, exposing thread enough to extend through the frame of the machine and accommodate a nut. Bolts may be set in the cement when the floor is laid, or holes may be drilled, the bolts inserted, and molten lead poured around them until flush with the floor. When cold the lead will have shrunk and should be pounded in tight. Washers or other pieces of metal may be used at the bolts to make the machine level. An especially sanitary setting for a separator may be made by setting the machine upon pieces of ¾-inch pipe about 1½ inches long. The machine is then supported upon four short posts, which makes cleaning the floor much easier.

A cream separator should be run according to the directions furnished by the manufacturer. Bearings and gearings should be kept clean, free from grit, and well lubricated with good oil. Special care should be used to run the machine at the speed recommended by the manufacturer. If a speed indicator is not used, the revolutions of the crank should be timed by a watch or a clock. In turning, even pressure should be maintained on the handle throughout the revolution, as jerking causes unequal wear on the bearings and the gears. The cream separator is probably the most delicate machine in general use on the farm, and should be handled with the care that its construction demands.

A separator does its best work only when run under proper conditions. It will not skim clean when (1) it is run too slowly, (2) the bowl wabbles or vibrates, (3) the milk is too cold, 90° F. being the minimum temperature for the best work, (4) the bowl parts are bent, dirty, or not properly assembled, (5) particles of foreign matter get into the bowl and partially obstruct the cream outlet, or (6) the milk is nearly sour. During the winter, in order to warm the bowl, some warm water should be run through the separator so that the first milk that enters will not be cooled below 90° F. When through separating, a small quantity of skim milk or warm water should always be used to flush the bowl in order that no cream may be wasted.

Like all other milk utensils, the separator should be cleaned thoroughly immediately after each time it is used. Merely flushing the bowl with warm water after use and taking it apart for washing but once a day is a filthy practice and must be condemned. All parts of the separator bowl, together with the other tinware, should first be rinsed with lukewarm water, then thoroughly scrubbed with a brush in warm water in which washing powder has been dissolved. Soap or soap powder are liable to leave a soapy film on the utensils and should not be used. Soda ash or one of the commercial dairy cleansing powders is satisfactory, as either is easily rinsed off. The utensils should then

be sterilized by means of the farm sterilizer[1] or boiled for five minutes. The use of a dish towel or cloth for drying is not necessary or desirable, because the hot utensils will dry of themselves, and in order that they may remain sterile they should be handled or touched as little as possible.

The thorough cleaning and sterilizing of all dairy utensils is essential to the production of butter of good flavor. Unclean utensils harbor bacteria that, when the utensils are used again, contaminate the milk and cream and develop bad flavors and thus injure the butter.

PROPER RICHNESS OF THE CREAM.

Thin cream has the same objectionable features for churning that whole milk has, though in a less degree. For that reason the cream separator should be regulated to deliver cream testing about 30 per cent butterfat, or so rich that 1 gallon will yield about 3 pounds of butter.

COOLING THE CREAM.

After separation, the cream should be placed immediately in cold water and stirred occasionally from the bottom with a stirring rod until the temperature is below 60° F. at least, and preferably below 50° F. Fresh cream should never be mixed with cream from previous skimmings until it has been thoroughly cooled, as the addition of warm cream raises the temperature of the older cream and hastens souring. Water is a much better cooling agent than air, because it is a better conductor of heat and is capable of absorbing greater quantities of heat. In cooling, the best results are obtained when ice water is used. A dairy farmer in a section where natural ice is produced should have an ice house and should fill it each winter.[2] If well water alone is used, it is necessary to change it several times a day. For that reason the cooling tank should be between the well and the stock tank, so that all water pumped for the stock passes through it. A spring or a stream of cold water is very satisfactory, because it performs the work continuously without attention.

Cooling tanks of various types may be obtained from dairy-supply houses or may be made on the farm. A satisfactory wooden tank may be made of 2-inch planed cypress boards properly bolted together, painted on the outside and oiled on the inside. Concrete makes a most serviceable tank which can be constructed by anyone accustomed to working with that material. A very simple and cheap cooling tank may be made also from two or more vinegar barrels—one for each cream can. Whatever the style of tank, the pipe con-

[1] An excellent apparatus and method for sterilizing dairy utensils on the farm are described in Farmers' Bulletin 748, a copy of which will be sent free by the United States Department of Agriculture upon request.

[2] Farmers' Bulletin 623, "Ice Houses and the Use of Ice on the Dairy Farm," may be obtained from the United States Department of Agriculture free upon request.

veying the water to it should be large enough to carry the full stream from the pump. Upon entering, the inlet pipe should be carried to within a few inches of the bottom by means of an ell and a short piece of pipe, so that the cold water may be conducted to the bottom, thus forcing the warmer water at the top through the outlet pipe. The outlet pipe should be at the end of the tank opposite the inlet pipe, of slightly larger diameter, and so high that the water will be nearly at the tops of the cans. Lock nuts and sheet packing may be used to make tight joints where pipes enter and leave the tank. Cream cans should stand on cleats in the tank, so that water may circulate under as well as around them.

FIG. 1.—Cooling or warming the cream to the proper churning temperature.

In order to afford protection from the heat, a cooling tank should have a tight cover and be placed in the dairy house or under a shed, where it will be protected from the hot winds and direct rays of the sun. If water does not flow continuously through the tank it may be advisable to insulate the tank, as an insulated tank uses less ice and requires less frequent changing of water than an ordinary one. Tanks of that type may be purchased at a reasonable cost, or the insulation may be put on at home. To insulate a tank at the lowest possible cost, 6 inches of dry excelsior, shavings, or sawdust, tightly packed on the sides, bottom, and cover of the tank, will serve the purpose if kept dry.

RIPENING THE CREAM.

On many farms it is customary to churn only two or three times a week. Where this is the case the cream from each separation should be kept in the cooling tank until about 12 hours before churning. In order that the cream may ripen uniformly, it should be placed in one receptacle, thoroughly mixed, and warmed slowly to a temperature of from 65° to 75° F. Frequent stirrings with the stirring rod and the use of a thermometer are necessary to insure uniform

and proper temperature throughout. Fresh cream should not be added after ripening has begun. The cream should be allowed to stand at the ripening temperature (from 65° to 75° F.) until it thickens, assumes a glossy appearance, and is mildly sour, when it should be cooled quickly to churning temperature or below. (The churning temperature is usually from 52° to 60° F. in the summer and 58° to 66° F. in the winter.) This cooling may be done if the cream is in a can by placing it in the cooling tank and stirring it occasionally. Ice or cold water should never be put into the cream. In order that the butter may have the desired firmness of body, the cream should be held at churning temperature or slightly below for at least two hours before it is churned. Even after it is cooled the cream will continue to sour somewhat, but when ready for churning it should still be only mildly sour, not to exceed 0.6 per cent acidity, as determined by the acidity test.

Special care should be taken to prevent the cream from becoming too sour, which has two harmful results—it gives the butter a sour, overripe cream flavor and injuries its keeping properties.

The souring of cream is caused by the growth of bacteria, which are a simple form of plant life. Some bacteria produce lactic acid and, as a by-product, the flavors that are desirable in butter. Many other types of bacteria, however, grow and produce bad flavors at the temperature used for ripening cream. If the milk or cream has been contaminated by unclean methods during milking or by utensils that have not been properly cleaned and sterilized, "off flavors" will develop in the cream during ripening and will be retained in the butter. Undesirable flavors may be developed even in clean cream if the ripening temperature is too high or too low or if the cream becomes overripe; in fact, an overripe cream flavor is one of the most common defects in farm butter.

The organisms that develop the desirable lactic acid and its attendant flavors in the cream are very susceptible to the influence of temperature. Although they grow and produce acid in a very wide range of temperature, the flavors that are desired in butter are produced only within a very narrow range. It is therefore very essential to use an accurate thermometer and to control the ripening temperature carefully. Lactic-acid bacteria are more active in summer than in winter, and for that reason, together with the fact that the temperature of the cream during ripening is usually affected somewhat by the atmospheric temperature, it is well to begin the ripening process at a higher temperature in winter than in summer. Experience will demonstrate just how to handle the cream so that it will be in the proper condition when it is desired to churn.

STARTERS.

In creameries it is customary to control to some extent the ripening of cream by means of "starters," which are pure cultures of lactic-acid-producing bacteria grown in pasteurized milk. The making of starters is technical work that should not be undertaken unless butter is made on a commercial scale. If the milk and cream are produced under proper conditions, there is no need for using starters. If handled under those conditions and protected from contamination, cream will develop the desired flavor when allowed to ripen or sour naturally at the proper temperatures.

When butter is made on a commercial scale, it may be advisable to control the ripening and thus make a product that is more uniform from week to week.

Commercial cultures for starter making may be obtained from culture manufacturers and from dairy-supply houses. Directions for using accompany each package and should be followed carefully.

A natural or homemade starter may be made as follows:

1. Clean thoroughly and boil for five minutes three pint fruit jars and tops. After boiling, keep the jars covered to prevent the entrance of bacteria.

2. Take a pint sample of milk freshly drawn from each of three cows, place in the jars, cover, cool to 75° F., and keep at that temperature until curdling occurs.

3. Curdling, or coagulation, should take place in about 24 hours. An ideal curd should be firm, smooth, marblelike, free from holes or gas bubbles, and should show little or no separation of the whey. It should have a clean, sharp, sour or acid flavor.

4. Select the sample that most closely meets those conditions and propagate it, discarding the others. The selected sample is propagated as follows:

(*a*) Clean thoroughly and boil for five minutes a quart jar, the top, and a teaspoon.

(*b*) Fill the jar with freshly drawn milk, cover loosely, heat slowly to boiling, and pasteurize by boiling gently for 30 minutes.

(*c*) Cool the milk to 75° F. and add a teaspoonful of curdled milk described in section 3 and set away to curdle at that temperature.

(*d*) Propagate the starter from day to day in the same manner described in (*a*), (*b*), and (*c*). The starter described in (*c*) is the one to use for ripening the cream, and should be added in such quantities as to be one-tenth to one-fifth of the cream to be churned. Starter is put into the cream while the latter is being warmed to the ripening temperature. The ripening process with starter is exactly the same as natural souring except that it takes place in a shorter time.

THE PROCESS OF CHURNING.

THE PROPER TEMPERATURE.

The desirable temperature at which to churn is that which makes the butter granules firm without being hard. This is usually obtained under normal conditions when the churning occupies 30 or 40 minutes. The churning temperature necessary depends upon the season of the year and certain other factors, but is usually from 52° to 60° F. in the summer and from 58° to 66° F. in the winter. If the cream is churned at 62° F. in winter, and the butter comes in 35 minutes, with the granules firm, it will be noticed, as summer approaches and the cows are turned out to pasture, that the cream churns more quickly and the butter is softer. This is an indication that a lower churning temperature should be used, and thus from season to season the churning temperature is regulated so that the butter granules may have the proper firmness.

FIG. 2.—Preparing the churn.

When the temperature is either too low or too high, undesirable results are obtained. A low temperature prolongs the churning period unnecessarily, and may even make it impossible to churn butter. It causes the granules, especially when the cream is thin, to form in tiny pellets, like fine shot, many of which run out with the buttermilk. The working of the butter and the incorporation of the salt are accomplished only with great difficulty, and the body of the butter is liable to be brittle and tallowy. Adding hot water to cream to warm it, and using wash water more than 3 degrees warmer than the butter in order to soften it, are bad practices, since they injure the quality of the butter. If the proper churning temperature is used, the butter granules will be of the proper firmness.

Too high a churning temperature in churning is even more to be avoided, because it is directly responsible for the following undesirable results:

1. Loss of butterfat in the buttermilk. When the churning temperature is high enough to reduce the churning period to about 10 minutes, the loss of butterfat in the buttermilk may be as great as 1 or 2 per cent, whereas, under proper conditions, the loss usually does not exceed 0.2 per cent.

2. Injury to the quality of the butter.

(*a*) Too much buttermilk in the butter. When the butter granules are so soft that they do not remain distinct, but stick together in large masses, the washing out of the buttermilk is greatly interfered

FIG. 3.—Straining cream into churn.

FIG. 4.—Adding butter color.

with and abnormally large quantities of it are incorporated into the butter. Butter of that kind has poor keeping qualities and quickly develops bad flavors. Other things being equal, the less buttermilk or curd in butter the better are its keeping qualities. The "off flavors" that so quickly develop in much of the farm-made butter are not produced by decomposition of the butterfat, but by decomposition of the milk solids which are found in the buttermilk. Because the drops of moisture expressed from the butter are milky in appearance, the butter is said to have a milky brine and for that reason is discriminated against.

(*b*) "Leaky" butter and too much moisture. Butter that "comes soft" retains large quantities of moisture from the buttermilk and wash water. Because of the softness of the butter the moisture is not well incorporated, but is found in pockets and large drops. Upon the butter standing some of the moisture oozes out, or, when the butter is cut, large drops appear on the cut surface. Such butter is said to be "leaky." That fault is objectionable in itself and has the additional objection of causing a material shrinkage in the weight of the butter.

FIG. 5.—Allowing gas to escape.

(*c*) A weak, salvy body. Butter properly made has a firm, waxy body, but high temperatures during manufacture make it soft and of a salvy consistency. When eaten it seems to melt slowly and stick to the mouth, in contrast to the quickly melting and quickly disappearing butter with a firm, waxy body.

The use of the proper churning temperature is therefore essential to the production of first-class butter, which means that the churning period must occupy 30 or 40 minutes. There is no short cut in churning. Patent churns that churn butter in seven minutes produce practically the same harmful results as those just described.

PREPARING THE CHURN.

When cream is ready for churning the churn should be prepared. It should be cleaned thoroughly, rinsed with scalding water, then thoroughly rinsed and chilled with cold water.

The butter ladles, paddles, worker, and printer should be treated in the same way, and all but the worker placed in a pail of cold water until needed. If that is not done, the butter will stick to them.

PUTTING THE CREAM INTO THE CHURN.

Cream should be poured into the churn through a strainer to break up possible lumps and to remove curd particles and any foreign matter that may be in it. In order to have the necessary concussion the churn should be only about one-third full. If too full, the churn-

ing period is prolonged, and if the cream foams it nearly fills the churn and prevents concussion. In that case it is usually necessary to remove some of the cream in order to obtain butter in a reasonable time.

FIG. 6.—Churning completed. From 30 to 40 minutes of churning is usually necessary to obtain butter particles the size of wheat kernels.

ADDING BUTTER COLOR.

Except late in the spring and early in the summer, when butter has a naturally high color, a small quantity of butter color is usually added. In winter the quantity required to produce a shade of yellow like the desirable June color varies from about 20 to 35 drops per gallon of cream.

The color having been added to the cream, the churn may be started at a speed to produce the greatest concussion, which can be determined largely by the sound. About 60 revolutions a minute is the usual speed for the common barrel type of churn. After a few revolutions the churn should be stopped, bottom up, and the cork removed to permit the escape of gas. (See fig. 5.) This is repeated two or three times in the early stages of churning. At that period cream produces a very liquid sound, and the glass in the churn is evenly covered with cream

FIG. 7.—Drawing off the buttermilk.

When churning is nearly completed there is a noticeable difference in the sound made by the cream, while on the glass in the churn a thick, mushy mass will appear, which occasionally breaks away, leaving the glass clear. At this point the butter granules are just forming, and the cream is thick and finely granular, like yellow cornmeal mush, with buttermilk separating slightly from the tiny gran-

ules. The churn should be revolved several times, then stopped and the butter examined in order to prevent overchurning. When the granules are the size of grains of wheat the churning is completed. To continue the churning until the butter is in large masses is a bad practice, because it incorporates quantities of buttermilk which can not be washed out. The bad effect of too much buttermilk in the butter has been discussed already.

FIG. 8.—Taking temperature of wash water.

Churning completed, the buttermilk is drawn through the hole at the bottom of the churn and is run through a strainer to catch any particles of butter. (See fig. 7.)

WASHING, SALTING, AND WORKING THE BUTTER.

WASHING.

The object of washing butter is to remove the buttermilk. The only way that this can be done properly is to wash the butter when it is in small granules so that the largest possible surface is exposed to the water. To try to remove buttermilk by working it out of the butter is not effective; moreover, the excessive working injures the grain and body of the butter.

While the last of the buttermilk is draining off the wash water should be prepared. Only pure, clean wash water should be used, and it should be twice the quantity of and at about the same temperature as the buttermilk. The water should be placed in a pail or other receptacle and its temperature determined with a thermometer; if necessary it should be tempered by the addition of either warm water or ice. If the butter granules are too soft or too hard the temperature of the wash water may be either a few degrees warmer or colder than the buttermilk. Warm water has the same effect upon the body of the butter as high churning temperatures, whereas cold water makes the butter so hard that it can be worked only with great difficulty, and if very cold the proper incorporation of the salt is practically impossible.

FIG. 9.—Removing the butter from the churn.

After the buttermilk has been drawn off, the cork is replaced and one-half the wash water is poured into the churn. The cover of the churn is then replaced and the churn given about four rapid revolutions. The wash water is drawn off and the washing repeated. Two washings are usually sufficient, the second wash water when drawn off usually being almost perfectly clear.

SALTING AND WORKING.

While the wash water is draining off the worker should be rinsed again with hot water followed by a thorough rinsing and cooling with cool water. This must be done immediately before using, because if the worker is slightly dry the butter will stick to it. The lever worker is widely used and gives satisfactory results, though other types do just as good work.

The butter, which is still in the granular condition, is removed from the churn with the ladle and placed in a convenient receptacle

FIG. 10.—Salting the butter.

for weighing. The old-fashioned butter bowl is convenient, and this is the only use that should be made of it. The butter having been weighed the quantity of salt is calculated on the basis of three-fourths of an ounce for each pound of butter. The quantity may be varied to suit personal taste or the requirement of the market. The best grade of butter salt or table salt should be used. The butter is placed upon the worker, spread out about 2 inches thick, and the salt, free of lumps, sifted upon it. The butter is then pressed with the lever or other device, care being taken to press and not to rub or smear it. After being pressed into a thin layer it is folded upon itself into a pile and the pressing repeated. The working is continued until there is a thorough and even distribution of the salt and a desirable grain and body have been produced.

The working of the butter is a very important step in the making process and should receive careful attention. Too much working is a common fault in farm-made butter. Overworked butter has a sticky and salvy body, a dull, greasy appearance, and gummy grain. It feels warm in the mouth, sticks, and dissolves slowly. Properly worked butter has a waxy body and a bright appearance, and feels cool and dissolves quickly in the mouth. Butter has a proper grain if a

FIG. 11.—Working the butter.

slab breaks when bent at an angle of about 45 degrees and the broken surface has the appearance of broken steel. In addition, overworking butter injures its keeping properties.

When butter is underworked it is brittle, may be gritty because of undissolved salt, and, worst of all, may be mottled or uneven in color. The latter fault is common, and the purchaser who is not versed in butter making sometimes thinks it is due to mixing light- and deep-colored butter, and for that reason mottled butter is strongly discriminated against on the market. Mottles are caused by the uneven distribution of salt, the deeper-colored streaks or spots containing more salt than those of lighter color. To prevent that condition the butter must be worked until the salt is evenly distributed throughout the butter. When underworked, especially if highly salted, the butter is liable to be gritty because of undissolved salt. That fault will not occur in properly worked butter unless an excess of salt has been added. Butter that is cold and very firm requires more working than when it is comparatively soft.

FIG. 12.—Printing butter.

BUTTER PACKAGES.

For home use butter is frequently packed into glazed earthenware crocks, which are very satisfactory and convenient receptacles for butter on the farm. If the glazing is imperfect, however, the crocks absorb butter and soon become very insanitary.

For market the rectangular 1-pound print is the most desirable form. It presents a more attractive appearance than the crock or "country roll," is more convenient and easily handled, and can be inserted into a carton which not only protects the butter but also adds greatly to the appearance of the package. To make prints, the printer is pressed upon the butter on the table until it is completely filled, the surplus is then scraped off with the paddle and the print

FIG. 13.—Leveling off the print.

pressed out on parchment wrapping paper. In order that the prints may weigh exactly a pound the printer should be carefully regulated and an occasional print weighed on an accurate scale. Prints for market should be wrapped in white parchment paper made for the purpose, 8 by 11 inches in size, and placed in paraffined cartons, upon which may appear the name of the farm or brand.

After printing and wrapping, the butter should be placed in a refrigerator or other cool place.

The churning utensils should then receive immediate attention. They should all be thoroughly cleaned by means of a hand brush, hot water, and dairy cleanser or washing powder, and thoroughly rinsed with boiling water. To place them in the sunshine or occasionally wash them with limewater aids in keeping them sweet.

DIFFICULT CHURNING.

The farm buttermaker sometimes fails to obtain butter after churning the usual length of time; in fact, the churning is sometimes prolonged for several hours without obtaining butter. The causes of the difficulty, together with the remedies, are as follows:

1. Churning temperature too low. It may be necessary, under exceptional conditions, to raise it to between 65° and 70° F.

2. Cream too thin or too rich. It should contain about 30 per cent butterfat.

3. Cream too sweet. If ripened to a moderate acidity it will churn more easily.

4. Churn too full. In order to obtain the maximum concussion the churn should be not more than one-third full.

5. Ropy fermentation of the cream preventing concussion. This may be prevented by sterilizing all the utensils and producing the milk and cream under the most sanitary conditions. If additional measures are needed, the pasteurization of the cream, with subsequent protection from contamination, and ripening it with a good starter, will be effective.

6. Individuality of the cow. The only remedy is to obtain cream from a cow recently fresh, or cream that is known to churn easily, and before ripening mix it with the cream that is difficult to churn.

7. The cow being far advanced in the period of lactation. The effects may be at least partially overcome by adding, before ripening, some cream from a cow that is not far advanced in the period of lactation.

8. Feeds that produce hard fat. Such feeds are cottonseed meal and timothy hay. Linseed meal, gluten feed, and succulent feeds such as silage and roots tend to overcome the condition.

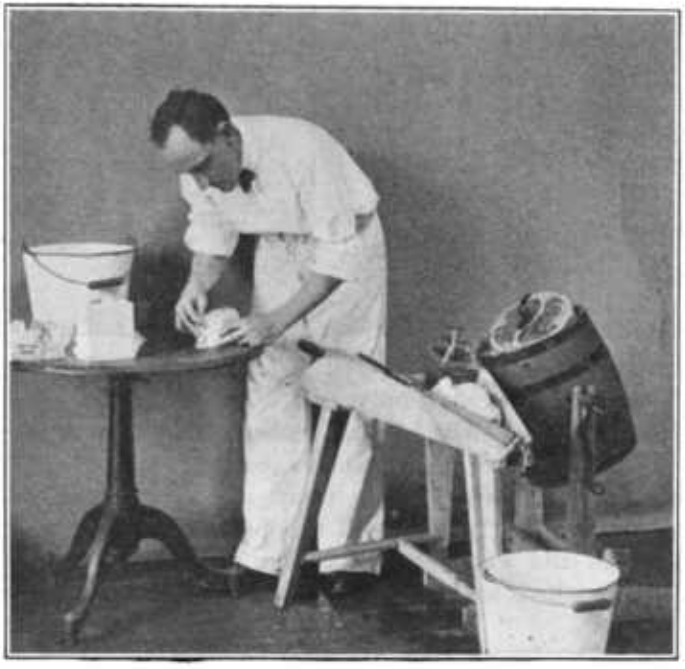

FIG. 14.—Wrapping print butter with parchment paper.

EQUIPMENT FOR FARM BUTTERMAKING.

The following equipment is needed for buttermaking on the farm:

1. *Milk pails.*—They should be of the type commonly known as covered-top, should be heavily tinned, and have all seams flushed with solder so that they can be cleaned easily.

2. *Cream separator.*—Any make is satisfactory if it skims clean and can be thoroughly cleaned and sterilized.

3. *Shotgun cans.*—As a cream container the style of can known as the "shotgun can" is much to be preferred to crocks and many other

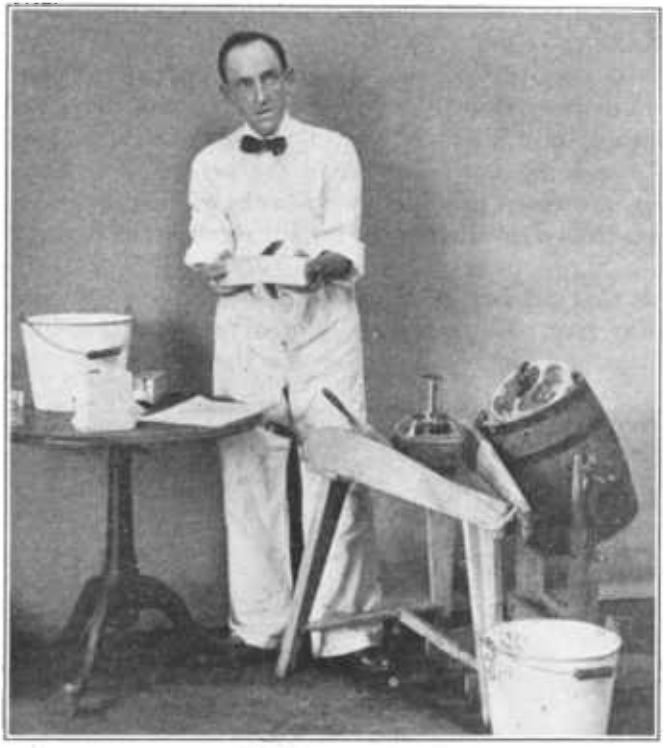

FIG. 15.—Inserting butter print in carton.

types of cans and pails commonly used. This can usually measures about 8½ inches in diameter and 20 inches high. One is shown in figure 1. These cans are easily handled, covered, and cleaned.

4. *Cream-cooling tank.*—Where there is an abundance of cold water any tank, properly used, will be effective. In very warm climates or where cold water can not be run through the tank several times daily, or where ice is used, it is advisable to use an insulated tank.

5. *Churn.*—The barrel type of churn (shown in several of the illustrations) is simple, inexpensive, easy to operate, and easily cleaned.

6. *Butterworker.*—The lever and the table butterworkers are very satisfactory. The former (fig. 11) is simpler and less expensive. When making large quantities of butter a table worker or combined churn and worker is frequently used.

7. *Thermometer.*—A floating dairy thermometer should be used.

8. *Cream and buttermilk strainer.*—A strainer similar to a colander or a strainer dipper is frequently used for straining both the cream and buttermilk. A hair sieve is sometimes used as a buttermilk strainer because butter does not stick to it as it does to tinware.

9. *Cream-stirring rod.*—A rod with a 4- or 5-inch disk on one end is more effective in stirring cream than a spoon or other implement. Stirring rods should be well tinned and smooth so that they may be cleaned easily.

10. Wooden paddle.

11. Wooden ladle.

12. Tin pails.

13. Half-gallon tin dipper.

14. Hand butter printer.

15. *Scrub brush.*—A stiff fiber brush is preferable to one with soft bristles.

PLAN OF DAIRY HOUSE.

A conveniently arranged dairy house is very desirable in making butter on the farm, especially if any considerable quantity is pro-

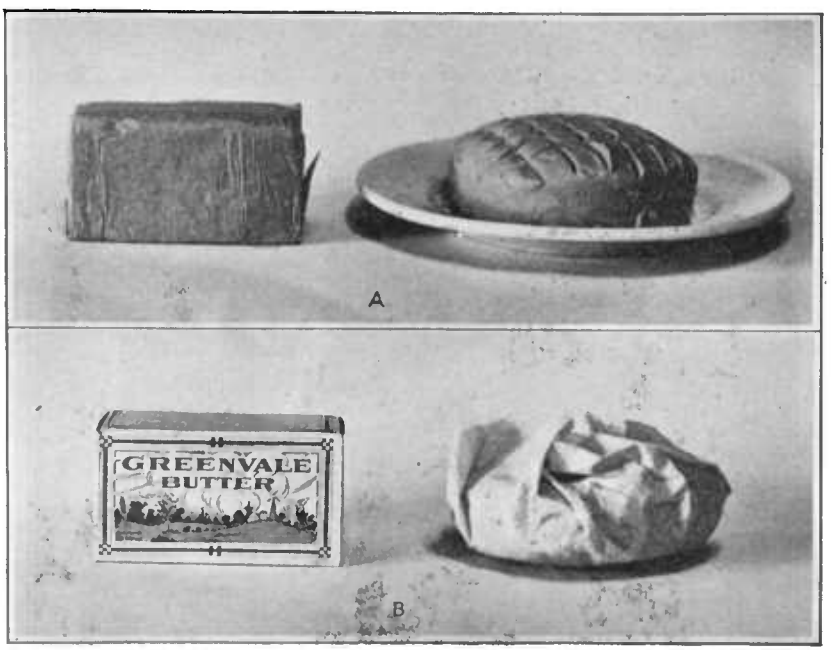

FIG. 16.—Comparison of the pound print and the country roll. The superiority of the former is obvious.

duced. A small, simple building will usually answer the purpose. A plan showing the principal features of such a house and a good arrangement of the equipment is shown in figure 18.

SUMMARY OF STEPS IN MAKING BUTTER ON THE FARM.

1. Produce clean milk and cream. Cool the cream immediately after it comes from the separator. Clean and sterilize all utensils.
2. Ripen the cream at from 65° to 75° F. until mildly sour. Always use a thermometer in order to know that the right temperature is reached.
3. Cool the cream to churning temperature or below, and hold at that temperature for at least two hours before churning.
4. Use a churning temperature—usually between 52° and 66° F.—that will require 30 or 40 minutes to obtain butter.
5. Clean and scald the churn, then half fill it with cold water and revolve until churn is thoroughly cooled, after which empty the water.
6. Pour the cream into the churn through a strainer.
7. Add butter color—from 20 to 35 drops to a gallon of cream—except late in the spring and early in the summer.
8. Put the cover on tight; revolve the churn several times; stop with bottom up, and remove stopper to permit escape of gas; repeat until no more gas forms.

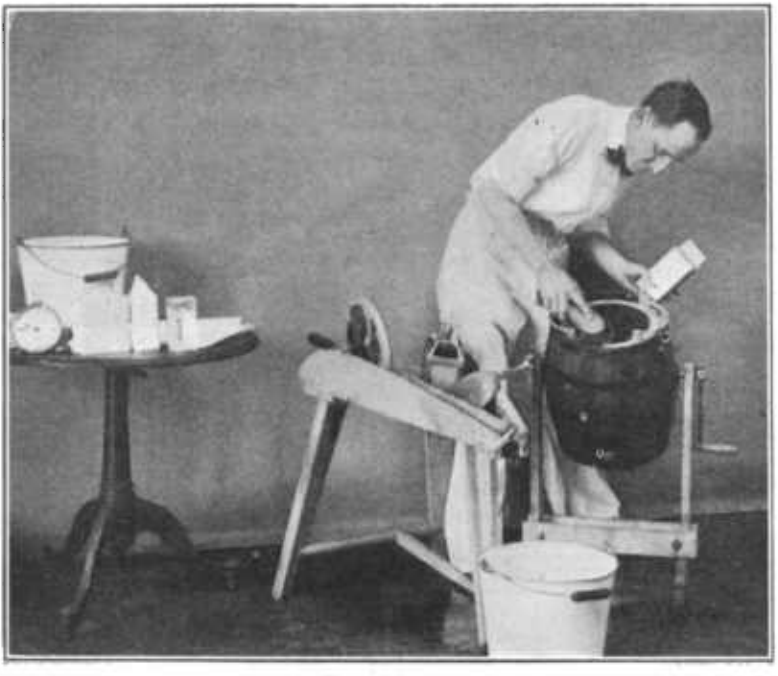

FIG. 17.—Washing butter utensils.

9. Continue churning until butter granules are formed the size of grains of wheat.

10. Draw off the buttermilk through the hole at the bottom of the churn, using a strainer to catch particles of butter. When the buttermilk has drained out, replace the cork.

11. Prepare twice as much wash water as there is buttermilk, and at about the same temperature. Use the thermometer; do not guess at temperatures. Put one-half the water into the churn with the butter.

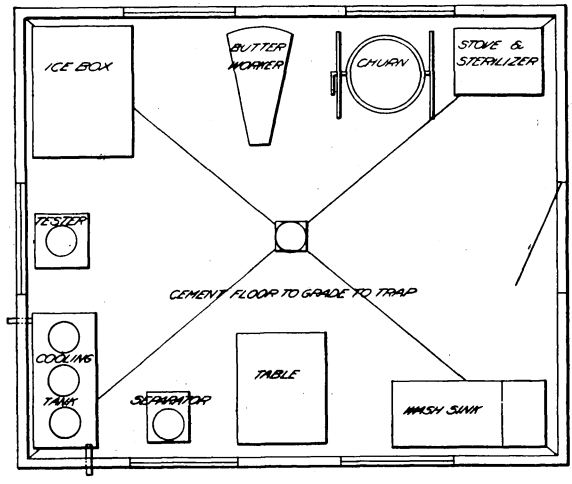

FIG. 18.—Plan of dairy house.

12. Replace the cover and revolve the churn rapidly a few times, then draw off the water. Repeat the washing with the remainder of the water.

13. The butter should still be in granular form when the washing is completed.

14. Weigh the butter.

15. Place the butter on the worker and add salt at the rate of three-quarters of an ounce to a pound of butter.

16. Work the butter until the salt is dissolved and evenly distributed. Do not overwork.

17. Pack in any convenient form for home use, or make into 1-pound prints for market, wrapping the butter in white parchment paper and inclosing in a paraffined carton.

18. Clean the churn and all buttermaking utensils.

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